

AMENDMENTS TO THE CLAIMS

Listing of claims:

1. (Currently Amended) A method for dynamic bandwidth allocation in a Passive Optical Network (PON), said PON includes an OLT and a plurality of ONUs accessing to the OLT, comprising:

a) classifying, by the OLT, services which are to be communicated between the OLT and an ONU into a plurality of service types according to different transmitting requirements, and granting a different priority to each type of the services, said services being classified by priority in descending sequence as Expedited Forwarding (EF) service, automatic detecting MPCP message service, non-automatic detecting MPCP message service, MF service, Assured Forwarding service and Best-Effort Forwarding service;

b) authorizing, by the OLT, a service port of every type of services to transmit service data in descending sequence of said priorities of the services, and recording the granting information of the service ports obtained from the authorization, the granting information of an EF service port comprising a start time of data transmission and the granting information of service ports carrying services among the automatic detecting MPCP message service, the non-automatic detecting MPCP message service, the MF service, the Assured Forwarding service and the Best-Effort Forwarding service not comprising the start time of data transmission;

c) reading out, by the OLT, said granting information of every to-be-granted service port of the same ONU; and

d) scheduling, by the OLT, start time of granted data transmission of every to-be-granted service port of current ONU, generating a downlink granting message including both said granting information and said start time of granted data transmission of every granted port of said current ONU, allocating adjacent granted windows for service ports different from the EF service port of

the same ONU when generating the downlink granting message, and transmitting said downlink granting messages to said current ONU.

2. (Previously Presented) The method according to Claim 1, further comprising:

generating, by the OLT, Active Timeout Counter to count non-response periods of each ONU;

and further comprising a flow of aging ONU information:

A. inquiring, by the OLT, status of the ONUs one by one, determining whether the status of current ONU is invalid, if yes, returning to step A; otherwise, proceeding to step B;

B. determining, by the OLT, whether MPCP messages have been reported by said current ONU in the present bandwidth allocation polling period, if yes, resetting corresponding Active Timeout Counter of said current ONU, and proceeding to step C; otherwise, proceeding to step C directly;

C. determining, by the OLT, whether the value of said Active Timeout Counter of said current ONU exceeds the settled off-line threshold, if yes, setting the status of the current ONU as invalid, releasing corresponding resources of this ONU, proceeding to step D; otherwise, proceeding to step D directly; and

D. determining, by the OLT, whether all the ONUs are inquired, if yes, ending the ONU information aging flow of the present bandwidth allocation polling period; otherwise, returning to step A, continuing with the inquiry of a next ONU.

3. (Previously Presented) The method according to Claim 2, further comprising:

generating, by the OLT, an ONU Status Information table indexed by ONUID, which is to store every ONU's status information that is generated according to MPCP messages communication between the ONUs and the OLT;

generating, by the OLT, an ONU Active Timeout Count table indexed by ONUID, which includes said Active Timeout Counter and reported flags to indicate whether MPCP messages have been reported by corresponding ONUs;

said step of determining in step A comprises: according to ONUID index, reading out, by the OLT, ONU status information from the ONU Status Information table one by one, determining whether current ONU is invalid according to said ONU status information;

said step of determining in step B comprises: reading out, by the OLT, table item of said current ONU from Active Timeout Count table, determining whether there exists a reported flag in corresponding table item of said current ONU, if yes, it can be concluded that MPCP messages have been reported in the present bandwidth allocation polling period; otherwise, it can be concluded that MPCP messages have not been reported;

between step C and step D, further comprising: clearing, by the OLT, the reported flag of said current ONU in the ONU Active Timeout Count table;

said step of determining in step D comprising: determining, by the OLT, whether all table items of the ONU Status Information table are read out, if yes, it can be concluded that all the ONUs have been inquired; otherwise, it can be concluded that some of the ONUs have not been inquired.

4. (Previously Presented) The method according to Claim 1, further comprising:

generating, by the OLT, a vMAC Granting information table indexed by ONUID, which includes granting information of each of the service ports of the ONUs and granted flags to indicate whether corresponding service ports are authorized;

the step of recording granting information in step b) comprises: recording, by the OLT, said granting information in the vMAC Granting information table, setting granted flag of said granted service ports as authorized;

the step of reading out granting information in step c) comprises: searching for, by the OLT, table items corresponding to the service ports of the same ONU in the vMAC Granting information table according to ONUID index, searching for granted service ports according to granted flag, reading out granting information of the granted service ports; and

after step d) further comprising: setting, by the OLT, the granted flag as negative of the service ports which have read out granting information.

5. (Previously Presented) The method according to Claim 1, further comprising:

generating, by the OLT, the ONU Status Information table indexed by ONUID, which is to store status information of every ONU that is generated according to MPCP messages communication between the ONUs and the OLT;

before step c) further comprising: reading out, by the OLT, status information of the ONUs one by one from the ONU Status Information table according to ONUID index, determining whether current ONU status is invalid according to the status information of said current ONU, if yes, returning to read a next ONU status information in the ONU Status Information table, otherwise, proceeding to step c).

6. (Cancelled)

7. (Currently Amended) The method according to Claim 61, wherein as to services except the automatic detecting MPCP message service, said step of authorization in step b) comprises:

b11) confirming, by the OLT, current to-be-granted service port according to uplink service activating status;

b12) according to the residual bandwidth resource in the current bandwidth allocation polling period, determining, by the OLT, whether current bandwidth resource is available to the constant amount of data of said current to-be granted service port for non-automatic detecting MPCP message service, or to the report information from said current to-be-granted service port for the other types of the services, if yes, proceeding to step b13); otherwise, proceeding to step b15);

b13) authorizing, by the OLT, said current to-be-granted service port to transmit service data, and recording the current granting information;

b14) updating, by the OLT, residual bandwidth in the current bandwidth allocation polling period and relevant information of said current to-be-granted service port; and

b15) determining, by the OLT, whether there are un-granted service ports of current priority service, if yes, returning to step b11); otherwise, authorizing the ports of the next priority service.

8. (Previously Presented) The method according to Claim 7, further comprising:

generating, by the OLT, a Service Active ONU Bitmap register for every type of service to store active information indicating whether the type of service is activated in the ONUs;

generating, by the OLT, a Service Active Port Bitmap table for services with port as unit, which is indexed by ONUID, to store active information indicating whether this type of service is activated in the accessed service ports of the ONUs;

generating, by the OLT, a vMAC Report Information table indexed by ONUID, to store report information from the accessed ports of the ONUs;

step b11) comprises: polling, by the OLT, the Service Active ONU Bitmap register and the Service Active Port Bitmap table of every service type in descending sequence of priorities, finding out a service port with positive active information and confirming the service port as said current to-be-granted service port;

before step b12) further comprising: finding out, by the OLT, report information of current to-be-granted service port from the vMAC Report Information table; and

in step b15), determining, by the OLT, whether there are unread table items in current Service Active ONU Bitmap register and current Service Active Port Bitmap table, if yes, returning to step b11); otherwise, inquiring the corresponding Service Active ONU Bitmap register and Service Active Port Bitmap table of the service with the next priority.

9. (Currently Amended) The method according to Claim 7, wherein

for the ~~fast-forwarding~~ EF service, said granting information comprising ~~start-time of data transmission and sizes~~ of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the ~~fast-forwarding~~ EF service, said step of scheduling granted start time in step d) comprising: taking said start time of data transmission of said granting information as the granted start time of data transmission;

for the non-automatic detecting MPCP message service, said granting information comprising downlink MPCP message type and reserved field, wherein said MPCP message type comprising Discovery GATE, Normal GATE and REGISTER&GATE; said report information comprising MPCP message type field and reserved field;

for the MF service, said granting information comprising reserved field and sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the Assured Forwarding service, said granting information comprising grant deficit quantity and sizes of data transmission of corresponding service ports; said report information comprising reported sizes of data waiting to be transmitted;

for the Best-Effort Forwarding service, said granting information comprising sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted.

- 10. (Canceled)

11. (Currently Amended) The method according to Claim-6_1, further comprising:

generating, by the OLT, a start-up counter for the automatic detecting MPCP message service;

the step of authorizing service ports in step b) comprises:

b21) initiating, by the OLT, said start-up counter, when said counter achieves configured threshold, launching the process of the automatic detecting MPCP messages service detecting, if an automatic detecting MPCP message is detected, proceeding to step b22); otherwise, resetting the start-up counter and returning to step b21);

b22) determining, by the OLT, whether current bandwidth resource is available to the constant amount of data of said current to-be-granted service port, according to the residual bandwidth resource in current bandwidth allocation polling period of the automatic detecting MPCP message service, if yes, entering step b23), otherwise, authorizing the ports of the next priority service;

b23) resetting, by the OLT, the start-up counter and returning to step b21).

12. (Orginal) The method according to Claim 11, wherein

for the automatic detecting MPCP message service, said granting information comprising downlink MPCP message type and reserved field, wherein said MPCP message type comprising Discovery GATE, Normal GATE, REGISTER&GATE.

13. (Previously Presented) The method according to Claim 1, after step d) further comprising: determining, by the OLT, whether there is still any ONU with un-granted port, if yes, returning to step c); otherwise, ending.

14. (Orginal) The method according to Claim 1, wherein the type of said downlink granting messages of the method is GATE downlink MPCP message.

15. (Previously Presented) The method according to Claim 7, wherein said uplink granting information of the present method being carried by REPORT messages.

16. (Previously Presented) The method according to Claim 2, wherein said bandwidth allocation polling period of the present method is the virtual frame period.

17. (Currently Amended) The method according to Claim 8, wherein

for the ~~fast-forwarding EF service~~, said granting information comprising ~~start time of data transmission-and-sizes~~ of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the ~~fast-forwarding EF service~~, said step of scheduling granted start time in step d) comprising: taking said start time of data transmission of said granting information as the granted start time of data transmission;

for the non-automatic detecting MPCP message service, said granting information comprising downlink MPCP message type and reserved field, wherein said MPCP message type comprising Discovery GATE, Normal GATE and REGISTER&GATE; said report information comprising MPCP message type field and reserved field;

for the MF service, said granting information comprising reserved field and sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the Assured Forwarding service, said granting information comprising grant deficit quantity and sizes of data transmission of corresponding service ports; said report information comprising reported sizes of data waiting to be transmitted;

for the Best-Effort Forwarding service, said granting information comprising sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted.

18. (Previously Presented) The method according to Claim 8, wherein said uplink granting information of the present method being carried by REPORT messages.

19. (Canceled)

20. (Previously Presented) The method according to Claim 7, wherein said bandwidth allocation polling period of the present method is the virtual frame period.

21. – 22. (Canceled)

23. (New) A method for dynamic bandwidth allocation in a Passive Optical Network (PON), said PON includes an OLT and a plurality of ONUs accessing to the OLT, comprising:

- a) classifying, by the OLT, services which are to be communicated between the OLT and an ONU into a plurality of service types according to different transmitting requirements, and granting a different priority to each type of the services;
- b) authorizing, by the OLT, a service port of every type of services to transmit service data in descending sequence of said priorities of the services, and recording the granting information of the service ports obtained from the authorization;
- c) reading out, by the OLT, said granting information of every to-be-granted service port of the same ONU; and
- d) scheduling, by the OLT, start time of granted data transmission of every to-be-granted service port of current ONU, generating a downlink granting message including both said granting

information and said start time of granted data transmission of every granted port of said current ONU, and transmitting said downlink granting messages to said current ONU;

wherein said services being classified by priority in descending sequence in step a) as Expedited Forwarding (EF) service, automatic detecting MPCP message service, non-automatic detecting MPCP message service, MF service, Assured Forwarding service and Best-Effort Forwarding service,

wherein as to services except automatic detecting MPCP message service, said step of authorization in step b) comprises:

b11) confirming, by the OLT, current to-be-granted service port according to uplink service activating status;

b12) according to the residual bandwidth resource in the current bandwidth allocation polling period, determining, by the OLT, whether current bandwidth resource is available to the constant amount of data of said current to-be granted service port for non-automatic detecting MPCP message service, or to the report information from said current to-be-granted service port for the other types of the services, if yes, proceeding to step b13); otherwise, proceeding to step b15);

b13) authorizing, by the OLT, said current to-be-granted service port to transmit service data, and recording the current granting information;

b14) updating, by the OLT, residual bandwidth in the current bandwidth allocation polling period and relevant information of said current to-be-granted service port; and

b15) determining, by the OLT, whether there are un-granted service ports of current priority service, if yes, returning to step b11); otherwise, authorizing the ports of the next priority service, and the method further comprising:

generating, by the OLT, a Service Active ONU Bitmap register for every type of service to store active information indicating whether the type of service is activated in the ONUs;

generating, by the OLT, a Service Active Port Bitmap table for services with port as unit, which is indexed by ONUID, to store active information indicating whether this type of service is activated in the accessed service ports of the ONUs;

generating, by the OLT, a vMAC Report Information table indexed by ONUID, to store report information from the accessed ports of the ONUs;

step b11) comprises: polling, by the OLT, the Service Active ONU Bitmap register and the Service Active Port Bitmap table of every service type in descending sequence of priorities, finding out a service port with positive active information and confirming the service port as said current to-be-granted service port;

before step b12) further comprising: finding out, by the OLT, report information of current to-be-granted service port from the vMAC Report Information table; and

in step b15), determining, by the OLT, whether there are unread table items in current Service Active ONU Bitmap register and current Service Active Port Bitmap table, if yes, returning to step b11); otherwise, inquiring the corresponding Service Active ONU Bitmap register and Service Active Port Bitmap table of the service with the next priority.

24. (New) The method according to Claim 23, wherein

for the EF service, said granting information comprising start time of data transmission and sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the EF service, said step of scheduling granted start time in step d) comprising: taking said start time of data transmission of said granting information as the granted start time of data transmission;

for the non-automatic detecting MPCP message service, said granting information comprising downlink MPCP message type and reserved field, wherein said MPCP message type comprising Discovery GATE, Normal GATE and REGISTER&GATE; said report information comprising MPCP message type field and reserved field;

for the MF service, said granting information comprising reserved field and sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the Assured Forwarding service, said granting information comprising grant deficit quantity and sizes of data transmission of corresponding service ports; said report information comprising reported sizes of data waiting to be transmitted;

for the Best-Effort Forwarding service, said granting information comprising sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted.

25. (New) A method for dynamic bandwidth allocation in a Passive Optical Network (PON), said PON includes an OLT and a plurality of ONUs accessing to the OLT, comprising:

a) classifying, by the OLT, services which are to be communicated between the OLT and an ONU into a plurality of service types according to different transmitting requirements, and granting a different priority to each type of the services;

b) authorizing, by the OLT, a service port of every type of services to transmit service data in descending sequence of said priorities of the services, and recording the granting information of the service ports obtained from the authorization;

c) reading out, by the OLT, said granting information of every to-be-granted service port of the same ONU; and

d) scheduling, by the OLT, start time of granted data transmission of every to-be-granted service port of current ONU, generating a downlink granting message including both said granting information and said start time of granted data transmission of every granted port of said current ONU, and transmitting said downlink granting messages to said current ONU;

wherin said services being classified by priority in descending sequence in step a) as Expedited Forwarding (EF) service, automatic detecting MPCP message service, non-automatic detecting MPCP message service, MF service, Assured Forwarding service and Best-Effort Forwarding service,

wherein as to services except automatic detecting MPCP message service, said step of authorization in step b) comprises:

b11) confirming, by the OLT, current to-be-granted service port according to uplink service activating status;

b12) according to the residual bandwidth resource in the current bandwidth allocation polling period, determining, by the OLT, whether current bandwidth resource is available to the constant amount of data of said current to-be granted service port for non-automatic detecting MPCP message service, or to the report information from said current to-be-granted service port for the other types of the services, if yes, proceeding to step b13); otherwise, proceeding to step b15);

b13) authorizing, by the OLT, said current to-be-granted service port to transmit service data, and recording the current granting information;

b14) updating, by the OLT, residual bandwidth in the current bandwidth allocation polling period and relevant information of said current to-be-granted service port; and

b15) determining, by the OLT, whether there are un-granted service ports of current priority service, if yes, returning to step b11); otherwise, authorizing the ports of the next priority service, wherein

for the EF service, said granting information comprising start time of data transmission and sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the EF service, said step of scheduling granted start time in step d) comprising: taking said start time of data transmission of said granting information as the granted start time of data transmission;

for the non-automatic detecting MPCP message service, said granting information comprising downlink MPCP message type and reserved field, wherein said MPCP message type comprising Discovery GATE, Normal GATE and REGISTER&GATE; said report information comprising MPCP message type field and reserved field;

for the MF service, said granting information comprising reserved field and sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the Assured Forwarding service, said granting information comprising grant deficit quantity and sizes of data transmission of corresponding service ports; said report information comprising reported sizes of data waiting to be transmitted;

for the Best-Effort Forwarding service, said granting information comprising sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted.

26. (New) A method for dynamic bandwidth allocation in a Passive Optical Network (PON), said PON includes an OLT and a plurality of ONUs accessing to the OLT, comprising:

- a) classifying, by the OLT, services which are to be communicated between the OLT and an ONU into a plurality of service types according to different transmitting requirements, and granting a different priority to each type of the services;
- b) authorizing, by the OLT, a service port of every type of services to transmit service data in descending sequence of said priorities of the services, and recording the granting information of the service ports obtained from the authorization;
- c) reading out, by the OLT, said granting information of every to-be-granted service port of the same ONU; and
- d) scheduling, by the OLT, start time of granted data transmission of every to-be-granted service port of current ONU, generating a downlink granting message including both said granting information and said start time of granted data transmission of every granted port of said current ONU, and transmitting said downlink granting messages to said current ONU;

wherein said services being classified by priority in descending sequence in step a) as Expedited Forwarding (EF) service, automatic detecting MPCP message service, non-automatic detecting MPCP message service, MF service, Assured Forwarding service and Best-Effort Forwarding service, and the method further comprising:

generating, by the OLT, a start-up counter for the automatic detecting MPCP message service;

the step of authorizing service ports in step b) comprises:

b21) initiating, by the OLT, said start-up counter, when said counter achieves configured threshold, launching the process of the automatic detecting MPCP messages service detecting, if an

automatic detecting MPCP message is detected, proceeding to step b22); otherwise, resetting the start-up counter and returning to step b21);

b22) determining, by the OLT, whether current bandwidth resource is available to the constant amount of data of said current to-be-granted service port, according to the residual bandwidth resource in current bandwidth allocation polling period of the automatic detecting MPCP message service, if yes, entering step b23), otherwise, authorizing the ports of the next priority service;

b23) resetting, by the OLT, the start-up counter and returning to step b21).